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Effectiveness of preliminary physiotherapy intervention in a child with tubercular meningitis along with acute ischemic infarct

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ABSTRACT

Acute bacterial meningitis (ABM) is a condition with a high incidence, high fatality and morbidity rates. The phenomenon Hydrocephalus, periventricular infarcts, optochiasmatic and spinal arachnoiditis, and tuberculous mass lesions in the brain are just a few of the consequences associated with tuberculous meningitis. We conducted a full neuro physiotherapy evaluation. We developed a rehabilitation program based on the data, which proved to be highly efficient in improving the child's condition and functional abilities. They had been complaining of fever for 1.5 months, decreased oral intake for 7 days, and tightness in all limbs with difficulty utilising the right upper and lower leg for 7 days when they came to see us. The child was also unable to communicate with a left-sided facial deviation. According to all tests, the patient acquired Tuberculous Meningitis with an acute cerebral infarct on the left side, resulting in right side hemiplegia and communicating hydrocephalus. The child's functional ability was greatly enhanced as a result of the physiotherapy rehabilitation we used. The facial muscle strength had improved, head control had improved, food intake had improved as swallowing and drooling of saliva had improved with overall increase in muscle strength.

Keywords: Tuberculous Meningitis (TBM), acute cerebral infarct, Hemiplegia, Physiotherapy rehabilitation, Case report

1. INTRODUCTION

Acute bacterial meningitis (ABM) is a condition with a high incidence, high fatality and morbidity rates, and the potential for outbreaks and epidemics (Wall et al., 2021). Tuberculous meningitis is a tuberculous infection of the meninges localised mainly to the base of the brain (Liggins, 1977). TBM is characterised by headache, vomiting, fever, altered consciousness, and visual loss, symptoms of meningeal irritation, cranial nerve palsies, focal deficits,

and seizures. TBM is accompanied by hydrocephalus, periventricular infarcts, optochiasmatic and spinal arachnoiditis, and tuberculous mass lesions in the brain, among other consequences. Up to 80% of children with tuberculous meningitis develop hydrocephalus (Paliwal and Garg, 2021). Bacterial meningitis can result in vasculitis of the cerebral vessels, resulting in thrombosis and an ischemic stroke. The most prevalent clinical complication of TBM-induced cerebral infarction is hemiplegia (Cresswell et al., 2020). The specific mechanism between malnutrition and tuberculosis is uncertain, however, under nutrition is a risk factor for the disease (Patel and Detjen, 2017).

We present the case of a 5-year-old male adolescent who was diagnosed with Tubercular meningitis, communicating hydrocephalus, and a left-sided acute cerebral infarct. We attempted to construct a protocol based on the findings of the Neurophysiotherapy assessment in order to enhance the child's condition and functional ability. To alleviate and rehabilitate the patient's condition, we performed several physiotherapy procedures based on the symptoms. The protocol we devised proved to be successful in improving the child's condition.

2. PATIENT INFORMATION

This case is reporting a 5-year-old male child with right-hand dominance who is a student by occupation. According to his mother, the child was fine until 1.5 months ago, when he had a moderate to high-grade fever. His behaviour changed after this fever episode, and he became irritated. He began to sleep more and his activities decreased. After two weeks, his parents went to a clinic in Paratwada, where they were given drugs but no relief. Then, by the fourth week, they went to an Amravati hospital, where they found no respite and the fever persisted. They presented to Acharya Vinobha Bhave Rural Hospital on January 12, 2022, with complaints of fever for 1.5 months, decreased oral intake for 7 days, and tightness of all limbs with difficulties using the right upper and lower leg for 7 days. The child also had a left-sided facial deviation and was unable to communicate. Then, on the same day, January 12, 2022, a brain MRI scan was conducted. A lumbar puncture was performed on the 13th of January 2022. The child also had a 15-day history of non-projectile vomiting. There is a history of facial nerve palsy and involuntary movements, including right upper limb flexion. The child gives a fall history. His nutritional history suggests a background of malnutrition, as he ate very little as a child, primarily rice and dal. The child developed Tuberculous Meningitis with an acute cerebral infarct on the left side i.e., right side hemiplegia and communicating hydrocephalus, according to all tests.

3. CLINICAL FINDINGS

The physical examination took place on January 15, 2022, after the child's parents given their informed consent. On General Examination child was conscious, co-operative and was not oriented with time, place and person. During the examination, the child was in supine lying. Pulse rate was 72 beats/min and respiratory rate was 32 breaths/min. On Observation, there was no pallor, icterus, clubbing, cyanosis, and oedema feet. After that, a systemic examination was performed. A thorough neurological examination was performed. On Higher mental function evaluation, GCS Score was E4 V1M5. On Cranial nerve examination, the 3rd, 7th, 9th and 10th nerves were impaired. On Sensory Examination, superficial sensations were intact, deep and cortical sensations were not accessible. On Motor Examination, the following findings were found. The limb girth measurement demonstrated that there was generalised muscular wasting throughout the body. Anterior fontanel bulging of 46 cm was discovered when the head circumference was measured. The Modified Ashworth Scale (MAS) and Voluntary Control Grading were used to assess muscle tone (VCG). The right side's upper limb had a grade of 2 and the lower limb had a grade of 1+ on MAS. Grade 1 going to 2 on the VCG Scale for the right- side upper limb, while grade 2 going to 4 for the lower limb. The right leg was determined to have tendoacillis tightness. The right side upper and lower limbs showed grade +++ on the Reflex Examination. The Gross motor functional measure (GMFM-88) score before the rehabilitation was 22%. Fig 1 depicts the condition of the patient before the physiotherapy rehabilitation.



Figure 1 A. depicting the posture of the child pre – rehabilitation. B. depicts assisted bridging done by the child.

Diagnostic assessment

MRI brain scan reveals

Acute infarct in the left corona radiata, gangliocapsular region, corpus callosum, left mesial temporal lobe and left middle cerebellar peduncle with communicating hydrocephalus. T2W1 / Flair Hyperintensities in the subcortical white matter left the high frontal region with no DWI restriction.

Lumbar puncture reveals

CSF Examination received approximately 1.5 ml of clear, colourless, transparent fluid in a sterile container.

Following are the values of the content of CSF:

Glucose – 24

Protein – 112

PH – 7.4

Lactose Dehydrogenase – 55

Therapeutic intervention

To help the child becomes functionally independent and to improve his condition, we developed a therapy plan. The physiotherapy regimen lasted six weeks. The entire procedure, which we followed for 6 weeks, is shown in Table 1. We employed a variety of outcome measures both before and after the rehabilitation to assess how the child's condition progressed. To assess the improvement in the child's condition and functional abilities, Graph 1 shows the Pre- and Post-rehabilitation outcome measure values.

Table 1 describing the treatment protocol given for 6 weeks to the child

Treatment Protocol for 0 to 2 weeks	
Goals of Physiotherapy	Therapeutic Intervention
The education will be given to the caregiver.	Counselling the child's parents about the child's condition and the need for physiotherapy treatment along with proper balanced diet in order to improve the nutrition of the body.
The child will be able to initiate the movement of the right-side facial muscles by the end of 2 weeks.	Motor Point Stimulation to the individual facial muscles using Galvanic current was given.
The spasticity will be reduced and the tone will be normalized by the end of 2 weeks.	Inhibitory techniques were employed – Joint Approximation Deep tendinous Pressure 3. Prolonged Icing
The child will be weaned off from Ryle's tube, drooling will be reduced and will be able to swallow viscous food in a span of 4 weeks of	Oromotor Stimulation – Oromotor facilitation with ice massage and tactile thermal stimulation were given. Compensatory strategies - Head Rotation , Chin Tuck Exercises -

intervention.	Shaker's exercises were given
The child will be able to gain the movements in the full range of motion and regain the flexibility within a span of 4 weeks.	Passive Movements, Stretching were given.
The child will be able to gain head control by the end of 4 weeks.	Facilitation by gentle stroking from distal to proximal of neck flexors, extensors and side-flexors was given.
The child will attain independent sitting with good core and pelvic strength by the edge of the bed by 6 weeks.	For pelvic muscles - Unilateral bridging exercise with assistance Bilateral bridging (Fig 1 B shows assisted bridging done by the child) For core muscles – Forward crunches

Treatment Protocol for 2 to 4 weeks

The same protocol for week 1 is followed and few additional interventions are employed

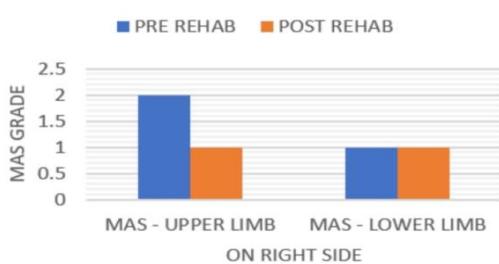
The facial muscles will be strengthened by the end of the 4 weeks.	Motor point stimulation using Faradic current Facial PNF was employed.
The child will regain the bed mobility in the form of rolling in a span of 5 weeks.	Vojta Therapy was used.

Treatment Protocol for 4 to 6 weeks

The same protocol for week 0 to 2 is followed and few additional interventions were given

The facial muscles strength will be maintained so on.	Facial Exercises were employed.
The child will be able to get good muscle strength in a span of 4 weeks.	Functional Electrical Stimulation (FES), Progressive Resistance exercises were given.
The child will achieve sitting within the bed by the end of 5 weeks.	Proprioceptive Stimulation on vestibular ball and Balance strategies for sitting - perturbations, reach outs were employed.

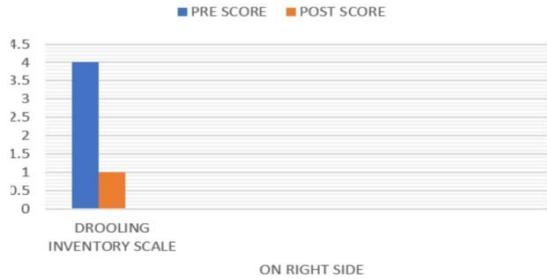
MAS GRADING



BRUNNSTORM STAGE FOR RECOVERY



DROOLING INVENTORY SCALE



GROSS MOTOR FUNCTION MEASURE (GMFM 88)



Graph 1 showing the Pre and Post Rehabilitation outcome measure scores.

4. DISCUSSION

Stroke occurs in 15–57 percent of people with tuberculous meningitis (TBM), especially in advanced stages and severe disease (Misra et al., 2011). A major consequence of tuberculous meningitis is cerebral infarction (CI) (TBM) (Chan et al., 2005). Various neurological therapies are effective in treating a variety of conditions. Their effects have been proven in a number of studies. Electrical stimulation enhances facial muscle strength and oral function in stroke patients with dysphagia, according to the study (Choi, 2016). Approximation, slow stroking, slow rolling, rocking, neutral warmth, prolonged stretch, and contract relax without resistance are examples of inhibitory techniques that can help reduce spasticity (Helsel et al., 2001). Similar techniques proved to be very effective in our patient. In some patients, Vojta therapy can help them acquire dynamic locomotor and gross motor skills (Gajewska and Neukirch, 2012).

Patients with tuberculosis meningitis encounter plenty of other consequences that inflict damage on their health. One of the complications that the child had was a brain infarct, which occurred after he fell and greatly impacted the child's functional ability. In such cases, early physiotherapy rehabilitation based on symptoms and assessment findings might be advantageous. We attempted to define and provide a rehabilitation plan that would aid the child's recovery and increase his or her functional ability. We were able to regain facial muscular strength, attain a milestone of sitting from head control, enhance food intake as swallowing and saliva drooling improved, and improve general muscle strength with the regimen. As a result, the child attained good functional ability to rejoin his school.

Chang et al., (2012) found an improvement in the Drooling Inventory Scale in CP patients after oral intervention in his study. Naghdi et al., (2010) conducted a study in which they found that the Modified Ashworth Scale showed improvement in post-stroke patients, which was connected with the Brunnstrom Recovery phases. Russell et al., (2000) stated in a study that the GMFM 88 scale might be used to assess functional improvement in individuals other than those with CP. These scales were used, and the therapy strategy we used resulted in a significant improvement in the child's condition.

5. CONCLUSION

The child's functional ability was greatly enhanced as a result of the physiotherapy rehabilitation we used. The effectiveness of the regimen was assessed using a variety of outcome measures, including the GMFM 88, Brunnstrom stage of recovery, Modified Ashworth Scale, and Drooling Inventory Scale. These tests revealed that facial muscle strength, head control, swallowing, saliva dribbling and total muscle strength had all improved significantly.

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Authors' contributions

KJS has made the original manuscript; RK and PH have read and approved the manuscript.

Informed consent

Written & oral informed consent was obtained from the patient.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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